(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 314 167 B1**

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **01.09.93** (51) Int. Cl.5: **B65H 3/06**, B65H 3/52

(21) Application number: **88118005.3**

(22) Date of filing: **28.10.88**

(54) Paper feeder.

(30) Priority: **30.10.87 JP 276827/87**
30.10.87 JP 167567/87 U

(43) Date of publication of application:
03.05.89 Bulletin 89/18

(45) Publication of the grant of the patent:
01.09.93 Bulletin 93/35

(84) Designated Contracting States:
DE FR GB

(56) References cited:
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US-A- 4 606 536

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Description

1. Field of the Invention

The present invention relates to paper feeders, and more particularly to a paper feeder, for example, for use in an image forming apparatus such as electrostatic transfer copying machines, laser printers and facsimile systems, electronic typewriters, word processors, ADFs for copying machines, etc comprising a paper feeder comprising a paper feed table for placing paper thereon, a transport roller for transporting the paper, a first shaft supporting the transport roller thereon, a delivery roller mounted on a first pivotably arm for delivering the paper from the feed table to the transport roller and a shutter attached to a second pivotably arm for preventing delivery of paper to the transport roller.

2. Description of the Prior Art

Conventional copying machines include a paper feed table for placing paper thereon, a transport roller for transporting the paper from the table toward feed rollers, a first arm pivotably supported by the shaft of the transport roller and extending toward the feed table, a delivery roller mounted on the forward end of the arm, a separating roller adapted for contact with the transport roller for preventing feed of more than one sheet of paper at a time, a second arm pivotably supported between the transport roller and the delivery roller, and a shutter attached to the second arm for blocking the paper.

The delivery roller and the shutter are controlled at the same time with a solenoid (see, for example, US-A-4 089 516) or individually by respective cams each at a proper time.

However, the former method requires a great solenoid for pivotally moving the delivery roller which is heavy and therefore involves the problem that the solenoid makes the machine large-sized.

The latter method requires a drive mechanism for each of the cams, similarly making the apparatus large-sized and necessitating an increased number of parts.

A automatic document feeder knwon from US-A-4.606.535 for automatically feeding individual sheets from a stack of individual sheets into a copy device provides for a guide plate and tray for holding a stack of individual sheets which are aligned and registered thereon by a movable stopper which engages the guide tray to enable such alignment. The stopper is hingably supported to allow for rotation thereof when moved out of engagement with the guide tray in order to prevent interference with the feeding of the individual sheets and damage thereto. Primary rollers are provided for feeding of individual sheets from the top of a stack of sheets and are supported above the stack of sheets for engagement and disengagement therewith to effect such feeding in coordination with movement of the stopper. This document discloses an improved stopper plate apparatus for an automatic document feeder whereby a conventional gear train and clutch assembly are used. This leads to a document feeder with a large size and an increased number of parts.

SUMMARY OF THE INVENTION

The paper feeder of the present invention is characterized by feed rollers for forwarding the paper transported by the transport roller, whereby said first arm is supported by the first shaft and extends toward the feed table, whereby said second arm is pivotably supported by a second shaft (10) and is disposed between the delivery roller and the transport roller, a first cam and a first cam shaft therefor for pivotally moving the first arm to thereby shift the delivery roller to an operative position, and a second cam and a second cam shaft therefor for pivotally moving the second arm to thereby shift the shutter to an operative position when the first arm is not pivotally moved, the first cam shaft and the second cam shaft being combined together in the form of a single rotary shaft.

According to the present invention, the first cam shaft for pivotally moving the first arm to thereby shift the delivery roller to an operative position comprises the same shaft as the second cam shaft for pivotally moving the second arm to thereby shift the shutter to an operative position. This is one of the important features of the present feeder, serving to make the feeder small-sized and rendering the delivery roller and the shutter pivotally movable with proper timing with good stability. Consequently, the feeder is operable with good stability at all times free of errors, for example, for use in high-speed copying machines.

The paper feeder of the present invention further includes drive means which are advantageously provided by a single solenoid, whereby the feeder can be compacted greatly.

Further according to the present invention, the feed table is removably attached to the body of an apparatus, such as an image forming apparatus, for which the feeder is used, and the transport roller is provided with a separating roller, a support member for supporting the separating roller upwardly and downwardly movably, pressure means for pressing the support member to bring the separating roller into pressing contact with the transport roller, and release means for bringing the pressure means out of operation with the removal of the feed table. The paper as nipped between the trans-

port roller and the separating roller is easily removable by virtue of this arrangement. Thus, the feeder is made operable with improved stability.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view showing a paper feeder embodying the invention as it is used for a copying machine;
Fig. 2 (a) is a perspective view of the same;
Fig. 2 (b) is a sectional view of a spring clutch;
Figs. 3 (a) and (b) to Figs. 5 (a) and (b) are views showing the relationship between spring clutches and pawls;
Fig. 3 (a) is a plan view showing the relationship when a solenoid is unenergized;
Fig. 3 (b) is a front view of the same;
Fig. 4 (a) is a plan view showing the relationship when the solenoid is energized;
Fig. 4 (b) is a front view of the same;
Fig. 5 (a) is a plan view showing the relationship when a clutch cover of the spring clutch has rotated almost by one turn upon the energization of the solenoid;
Fig. 5 (b) is a front view of the same.
Figs. 6 to 11 are diagrams showing the relationship of two cams with a delivery roller and with a shutter;
Fig. 6 is a diagram showing the relationship between the first cam and the shutter in a standby position;
Fig. 7 is a diagram showing the relationship between the second cam and the delivery roller in a standby position;
Fig. 8 is a diagram showing the relationship between the second cam and the shutter as positioned for the delivery of paper;
Fig. 9 is a diagram showing the relationship between the first cam and the delivery roller as positioned for the delivery of the paper;
Fig. 10 is a diagram showing the relationship between the second cam and the shutter after the clutch cover has rotated almost by one turn;
Fig. 11 is a diagram showing the relationship between the first cam and the delivery roller after the clutch cover has rotated almost by one turn;
Fig. 12 is a front view showing pressure means for a separating roller;
Fig. 13 is a fragmentary enlarged view of the same;
Fig. 14 is a side elevation partly broken away and showing means for reversely rotating the separating roller;
Fig. 15 is a front view showing the directions of rotation of the separating roller;
Fig. 16 is a front view showing another embodiment of the invention;
Fig. 17 is a front view showing conventional pressure means; and
Fig. 18 is a front view showing another conventional pressure means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(i) First, a paper feeder K for use in a copying machine will be described generally to clarify the features thereof. With reference to Figs. 1 and 2, the paper feeder K comprises a paper feed table 2 for placing paper 1 thereon, a transport roller 5 for transporting the paper 1 toward feed rollers 3, 4, a first shaft 6 supporting the roller 5 thereon, a first arm 7 pivotally supported by the first shaft 6 and extending toward the feed table 2, a delivery roller 8 mounted on the forward end of the first arm 7, a second arm 11 supported by a second shaft 10 and disposed between the transport roller 5 and the delivery roller 8, a shutter 12 attached to the second arm 11 for blocking the paper 1, a first cam 39 for pivotally moving the delivery roller 8 about the first shaft 6, and a second cam 72 for pivotally moving the shutter 12 about the second shaft 10. As seen in Fig. 3 (a), the feeder is first characterized in that the first cam 39 and the second cam 72 are commonly mounted on the drive shaft 38 of a clutch 41 for controlling the rotation of the two cams 39, 72.

The feeder is further characterized in that a single solenoid 22 controls a clutch 15 for controlling the rotation of the transport roller 5 and the clutch 41 for controlling the rotation of the cams 39, 72.

When the paper 1 is to be fed, the delivery roller 8, which is usually in a raised position as seen in Fig. 1, temporarily falls onto the paper 1 under gravity after the shutter 12 is raised, delivering the paper 1 to the transport roller 5. The paper 1 is then transported by the roller 5 to the feed rollers 3, 4 which are at a stop. The feed rollers 3, 4 start to transport the paper 1 in synchronism with a document scanning table, with the leading end of the paper in coincidence with the leading end of the document image.

Fig. 3 (b) shows the solenoid 22 as unenergized. A clutch cover 19 of the clutch 15 and a clutch cover 45 of the clutch 41 are restrained from rotation by a first pawl piece 21 and a third pawl piece 49, respectively, so that the transport roller 5 and the cams 39, 72 are at rest, with no drive power transmitted thereto. Thus, the parts are in a standby position as seen in Figs. 6 and 7.

When the solenoid 22 is energized, the first pawl piece 21 releases the clutch cover 19 to

drive the first shaft 6, which in turn starts rotating the transport roller 5. The rotation of the first shaft 6 also starts rotating the delivery roller 8 through gears 28, 31 and 30. Further since the clutch cover 45 is also released from the third pawl piece 49 to rotate the cams 39, 72 as seen in Fig. 4, the shutter 12 and the delivery roller 8 start to move as shown in Figs. 8 and 9 (delivery and transport of the paper).

The clutch 41 has right and left claws 46, 47 which are displaced from each other axially thereof, and a second pawl piece 48 and the third pawl piece 49 are similarly displaced from each other, with the result that when the clutch cover 45 has almost completed one turn of rotation after the energization of the solenoid 22, the second pawl piece 48 engages the claw 47 as seen in Fig. 5 (b). Consequently, with the solenoid 22 in energized state, the clutch 15 remains engaged to hold the transport roller 5 in rotation, whereas the clutch 41 is disengaged upon the clutch cover rotating almost one turn to stop the cams 39, 72. By this time, the delivery roller 8 is in its raised position as seen in Fig. 11, while the shutter 12 is in its lowered position as shown in Fig. 10 (transport of the paper).

The solenoid 22 is deenergized a specified period of time after a sensor switch 75 detects the paper to warp the paper.

Upon the deenergization of the solenoid 22, the first pawl piece 21 engages the clutch cover 19 of the clutch 41 to stop the transport roller 5. The clutch 41 stops upon returning to the initial position (Fig. 3) after completing one turn of rotation, whereby the paper feed operation is completed (warping the paper, standby state).

As will be apparent from the above description, the first and second cams for pivotally moving the delivery roller and the shutter are commonly mounted on the same shaft as the clutch for controlling these cams, so that the paper feeder K can be small-sized. With the two cams mounted on the same shaft, the delivery roller and the shutter are pivotally movable with proper timing with good stability. This assures a stabilized paper feed operation at all times free of errors for a high-speed copying operation.

The paper feeder has another advantage in that it can be produced in a smaller size at a lower cost because a single compact solenoid is used for controlling the clutch for controlling the rotation of the transport roller and the clutch for controlling the rotation of the cams.

(ii) The paper feeder K for the copying machine further comprises a separating roller 9 adapted to contact the transport roller 5 for preventing feed of more than one sheet of paper at a time (double feed), and support-pressure means 54 for supporting the separating roller 9 and pressing the roller 9 against the transport roller 5 as seen in Figs. 1 and 12. The paper feed table 2 is removably attached to the body 13 of the copying machine. The feeder further comprises release means 54A for releasing the separating roller 9 from pressing contact with the transport roller 5 when the table 2 is removed from the machine body 13.

The separating roller 9 is mounted on the forward end of a pressure lever 56 movable about a pivot 55 on the machine body 13. The pressure lever 56 is provided at its forward end with a guide ring 57 for laterally guiding the shaft 9a of the separating roller 9. The roller shaft 9a is fitred in the ring 57 and is also fitted in a vertical groove 59 in a support plate 58 on the body 13 vertically movably.

The paper 1 to be fed is transported by the transport roller 5 to the feed rollers 3, 4, which in turn start to further transport the paper 1 in synchronism with the document scanning table, with the leading end of the paper in coincidence with the leading end of the document image.

The paper feed table 2 for stacking sheets of paper thereon is removable when to be carried. The release means 54A has a pivotal piece 63, which is moved upward by a spring 61 when the table 2 is removed as seen in Fig. 12, releasing the separating roller 9 from pressing contact with the transport roller 5. The paper 1 as nipped between the rollers 5, 9 is then easily removable.

While the pressure lever 56 exerts pressure on the shaft 9a of the separating roller 9, the guide ring 57 of the lever 56 has a laterally elongated hole for retaining the roller shaft 9a therein. The shaft 9a is laterally restrained by the vertically grooved portion 59 of the separate guide plate 58, so that the roller 9 is pressed on at all times from immediately below the transport roller 5.

The pressure means and the release means therefor need not always be so constructed as described above but may have the construction shown in Fig. 16. A solenoid 76 has a plunger 78 connected to the pressure lever 56 and biased by a spring 77 toward the transport roller 5. A microswitch 79 is disposed under a lower guide plate 65a defining a path of feed of the paper, 65. A plate spring 79a for actuating the switch 79 when the feed table 2 is removed is disposed in the vicinity of the switch 79.

When the feed table 2 is removed with this arrangement, the plate spring 79a moves upward to turn on the switch 79, causing the solenoid 76 to withdraw the plunger 78 and moving the separating roller 9 away from the

transport roller 5.

The body of the copying machine may be provided with a handle for use in transporting the machine.

With the paper feeder K described above, the separating roller is released from pressing contact with the transport roller by the release means when the paper feed table is removed, so that the paper nipped between the rollers can be readily removed merely by the simple procedure of removing the paper feed table.

Further because the guide ring of the pressure lever has a laterally elongated hole for retaining the separating roller shaft, which is restrained by the vertically grooved portion of the guide plate, pressure is applied to the separating roller from immediately below the transport roller at all times. This assures the advantage that the paper can be fed with good stability.

Figs. 17 and 18 show conventional pressure means, in which a separating roller 80 is supported directly by a pressure lever 81 or 82. Depending on the position 83 or 84 where the lever 81 or 82 is supported and on the direction of rotation of a transport, the pressure to be applied decreases or increases, so that it is difficult to obtain a definite pressure at all times.

Further when the level at which the rollers 80 and 85 are in contact with each other varies, the position of contact also varies laterally and is not always definite. Consequently, the paper inserted manually can not be fed with good stability.

(iii) The paper feeder K for the copying machine will be described in its entirety in greater detail.

With reference to Figs. 1 and 2, the paper feeder K comprises a paper feed table 2 for placing paper 1 thereon, a transport roller 5 for transporting the paper 1 toward feed rollers 3, 4, a first shaft 6 supporting the roller 5 thereon, a first arm 7 pivotally supported by the first shaft 6 and extending toward the feed table 2, a delivery roller 8 mounted on the forward end of the first arm 7, a separating roller 9 adapted to contact the transport roller 5 for preventing double feed, a second arm 11 supported by a second shaft 10 and disposed between the transport roller 5 and the delivery roller 8, and a shutter 12 attached to the second arm 11 for blocking the paper 1. The second shaft 10 is rotatably supported by the body 13 of the copying machine.

The transport roller 5 has its center shaft, i.e. the first shaft 6, rotatably supported on the body 13. A drive gear 14 for drivingly rotating the first shaft 6 is connected to the shaft 6 by a first spring clutch 15. Power is transmitted to the drive gear 14 from the machine body 13. The first spring clutch 15 comprises, as seen in Fig. 2 (b), a coiled spring 18 wound around a boss 16 formed on one shaft end of the drive gear 14 and around a boss 17 formed on one end of the first shaft 6, a hollow cylindrical clutch cover 19 fitted around the coiled spring 18, a hollow cylindrical latch 20 fixedly provided around the clutch cover 19 as shown in Figs. 3 (a) and (b), a first pawl piece 21 engageable with the latch 20, and a solenoid 22 serving as drive means for bringing the first pawl piece 21 into or out of engagement with the latch 20. The spring 18 has one end engaged with the clutch cover 19 and the other end secured to the boss 17 of the first shaft 6. The spring 18 is wound in a direction to fasten together the boss 16 of the drive gear 14 and the boss 17 of the first shaft 6. When the clutch cover 19 is restrained from rotation, the spring 18 is loosened from the boss 16 so as not to transmit the torque of the drive gear 14 to the first shaft 6.

With reference to Fig. 3 (b), the first pawl piece 21 is rotatably supported at a central boss portion thereof by a pivot 24 on the body 22a of the solenoid and has one end 21a in engagement with a pin 25 on the second pawl piece 48 to be described later. The first pawl piece 21 is so associated with the second pawl piece 48 as to be moved away from the latch 20 by the rotation of the piece 48 in an engaging direction. A spring 26 is connected between another end 21b of the first pawl piece 21 and the body 22a of the solenoid for biasing the first pawl piece 21 into engagement with the latch 20.

With reference to Fig. 2 (a), drive means 27 for drivingly rotating the delivery roller 8 comprises a first gear 28 fixedly mounted on the other end of the frist shaft 6 of the transport roller 5, a second gear 30 fixed to the rotary shaft 29 of the delivery roller 8 and opposed to the first gear 28, and an intermediate gear 31 provided between the first and second gears 28, 30 and supported by the first arm 7.

As shown in Figs. 2 (a), 7, 9 and 11, a mechanism 33 for pivotally moving the first arm 7 of the delivery roller 8 comprises a pivotal arm 35 movably supported on a pivot 34 parallel to the shaft 29 of the delivery roller 8 and provided on the machine body 13, a link pin 37 extending from the midportion of the first arm 7 and fitted in a slot 36 formed in the free end of the arm 35, a first cam 39 secured to a driven shaft 38 parallel to the first shaft 6 of the transport roller 5 for moving the pivotal arm 35, a driven member 40 secured to the pivotal arm 35 so as to contact the cam face of the first cam 39, and drive means 42 for transmitting power from the machine body 13 to the driven shaft 38 through a second spring clutch 41 as seen in Fig. 3 (a). The drive means 42 comprises a

transmission gear 43 meshing with the drive gear 14, and a driven gear 44 in mesh with the gear 43.

With reference to Figs. 3 and 4, the second spring clutch 41 is interposed between the shaft of the drive gear 44 and the driven shaft 38. Like the first spring clutch 15, the clutch 41 comprises a coiled spring, a clutch cover 45, etc. However, the clutch cover 45 is provided on its outer periphery with a pair of clutch claws 46 and 47 which are displaced from each other axially thereof. The second pawl piece 48 which is at the left and a third pawl piece 49 at the right are engageable with the clutch claws 47 and 46, respectively (see Fig. 3 (b)).

With reference to Fig. 3 (b), the second and third pawl pieces 48, 49 extend away from each other as secured to a boss portion 51 which is rotatably fitted around a pivot 50 on the machine body 13. A pivotal piece 52 secured to the boss portion 51 is connected to the plunger 22b of the solenoid 22. A spring 53 is connected between the pivotal piece 52 and the machine body 13 for biasing the second pawl piece 48 away from the clutch claw 47.

With reference to Figs. 12 to 15, the separating roller 9 is pressed against the transport roller 5 by support-pressure means 54 having the following construction. The separating roller 9 is mounted on the forward end of a pressure lever 56 movably supported by a pivot 55 on the machine body 13. The pressure lever 56 is formed at its forward end with a guide ring 57 for guiding the shaft 9a of the separating roller 9 in a lateral direction. The shaft 9a is fitted in the ring 57. The roller shaft 9a is further fitted from above in a vertical groove 59 formed in a support plate 58 on the machine body 13. The separating roller 9 is biased toward the transport roller 5 by a coiled spring 61. The spring 61 has a coiled portion fitted around the pivot 55 for the pressure lever 56, one end 61a bearing against the underside of the guide ring 57, and the other end 61b engaged in a slot 64 in a pivotal piece 63 movably supported by a pivot 62 on the machine body 13.

With reference to Figs. 1 and 12, the separating roller 9 is freed from the force of the spring 61 by release means 54A, which comprises the above-mentioned pivotal piece 63. The pivotal piece 63 is disposed under a lower guide plate 65a defining a path of feed of the paper in the machine body 13. The feed table 2 has at its forward end an extension plate 2a which is removably positioned between the pivotal piece 63 and the lower guide plate 65a. When the feed table 2 is removed, the pivotal piece 63 moves upward, freeing the separating roller 9 from the force of the spring 61 and permitting the roller 9 to move away from the transport roller 5 under gravity.

The separating roller 9 is usually driven by the transport roller 5, but when at least two sheets of paper are delivered thereto, the roller 9 reversely rotates to preclude double feeding. Fig. 14 shows reversing means 66 therefor. The means 66 for reversely rotating the separating roller 9 comprises a brake plate 67 fitted around the shaft 9a of the roller 9 slidably axially thereof and rotatable with the shaft, and a coiled spring 67a for biasing the brake plate 67 into pressing contact with the separating roller 9. Owing to the frictional resistance between the roller 9 and the brake plate 67, the roller 9 is not rotatable relative to the shaft 9a unless subjected to a torque exceeding a specified value. The roller shaft 9a usually rotates in the same direction (arrow a shown) as the transport roller 5 as seen in Fig. 15, but when no paper is transported or when only one sheet of paper is transported, the frictional resistance between the transport roller 5 and the separating roller 9 or between the paper and the separating roller 9 is greater than the frictional resistance between the roller 9 and the brake plate 67, so that the separating roller 9 rotates in a direction (arrow b shown) opposite to the direction of rotation of the shaft 9a, the roller 9 thus being rotated by the transport roller 5. Alternatively when at least two sheets of paper are delivered to the transport roller at the same time, the frictional resistance between the separating roller 9 and the brake plate 67 is greater than that between the sheets, causing the separating roller 9 to rotate in the same direction (arrow c shown) as the shaft 9a to preclude double feed.

As seen in Fig. 2 (a), torque is delivered to the roller shaft 9a from a gear 6a fixed to the first shaft 6 of the transport roller 5.

With reference to Figs. 2 and 6, means 68 for pivotally moving the shutter 12 comprises the second shaft 10 supported on the machine body 13 for pivotally moving the shutter, the second arm 11 mounted on the second shaft 10, an L-shaped driven member 71 secured to the boss portion 70 of the second arm 11, a second cam 72 mounted on the same shaft as the first cam 39 (see Fig. 7) for the driven member 71 to follow its cam surface, etc. The shutter 12 is attached to the forward end of the second arm 11 by a pin 73.

The cams 39 and 72 are so shaped and positioned as will be described with reference to Figs. 6 to 11. First, the shutter 12 is completely moved up to a raised position by the second cam 72, whereupon the first cam 39 causes the arm 35 to move down the delivery roller 8. Before the spring clutch 41 (see Fig. 3 (a)) makes one turn of rotation, the first cam 39 conversely lifts the delivery roller 8 completely to a raised position. The shutter 12 is thereafter lowered. The cams 39 and 72 are so shaped and timed as to effect the above move-

ments. The period of time during which the delivery roller 8 is in its lowered position is so determined that the delivery roller 8 can satisfactorily deliver the paper to the transport roller 5. Since the cams 39 and 72 are mounted on the same shaft the shutter and the delivery roller are controlled with proper timing without any error. This assures stabilized operation of the present feeder at all times even when it is used for a high-speed copying machine.

A generally L-shaped upper guide plate 74 is provided between the transport roller 5 and the feed rollers 3, 4 for permitting warping of the paper. In proximity to these rollers 3, 4, a paper sensor switch 75 is provided at the forward end of the upper guide plate 74.

Indicated at 65b is an upper guide plate defining the paper feed path 65.

The operation of the feeder will be described next. The delivery roller 8, which is usually in its raised position as seen in Fig. 1, temporarily falls onto paper 1 under gravity after the shutter 12 is raised, delivering the paper 1 to the transport roller 5. The paper 1 is then transported by the roller 5 and the separating roller 9 to the feed rollers 3, 4 which are at rest.

The paper 1 transported by the roller 5 is detected by the sensor switch 75. A specified period of time after the detection, the transport roller 5 is stopped to warp the paper at the portion thereof positioned between the transport roller 5 and the feed rollers 3, 4. This prevents the leading edge of the paper 1 from skewing with respect to the widthwise direction of the feed path. The feed rollers 3, 4 start to transport the paper 1 in synchronism with the document scanning table, with the leading end of the paper in coincidence with the leading end of the document image.

Fig. 3 (b) shows the solenoid 22 as unenergized. The clutch cover 19 and the clutch cover 45 are restrained from rotation by the first pawl piece 21 and the third pawl piece 49, respectively, so that the transport roller 5 and the cams 39, 72 are at rest, with no drive power transmitted thereto. Thus, the parts are in the standby position of Figs. 6 and 7.

With reference to Fig. 4 (b), when the solenoid 22 is energized, the first pawl piece 21 releases the clutch cover 19 to drive the first shaft 6, which in turn starts rotating the transport roller 5. The rotation of the first shaft 6 also starts rotating the delivery roller 8 through the gears 28, 31 and 30 as seen in Fig. 2 (a). Further since the clutch cover 45 is also released from the third pawl piece 49 to rotate the cams 39, 72 as seen in Figs. 4 (a) and (b), the shutter 12 and the delivery roller 8 start to move as shown in Figs. 8 and 9 (delivery and transport of the paper).

With reference to Figs. 3 (a) and (b), the right and left claws of the second spring clutch 41 are displaced from each other axially thereof, and the second pawl piece 48 and the third pawl piece 49 are similarly displaced from each other, with the result that when the clutch cover 45 has almost completed one turn of rotation after the energization of the solenoid 22, the second pawl piece 48 engages the claw 47 as seen in Fig. 5 (b). Consequently, with the solenoid 22 in energized state, the clutch 15 remains engaged to hold the transport roller 5 in rotation, whereas the clutch 41 is disengaged upon the clutch cover rotating almost one turn to stop the cams 39, 72. By this time, the delivery roller 8 is in its raised position as shown in Fig. 11, while the shutter 12 is in its lowered position as shown in Fig. 10 (transport of the paper).

The solenoid 22 is deenergized the specified period of time after the sensor switch 75 detects the paper to warp the paper.

Upon the deenergization of the solenoid 22, the first pawl piece 21 engages the clutch cover 19 of the spring clutch 41 to stop the transport roller 5. The clutch stops upon returning to the initial position (Fig. 3) after completing the rest of the one turn of rotation, whereby the paper feed operation is completed (warping the paper, standby state).

The paper feed table 2 for stacking up sheets of paper thereon is removable when to be carried. When the table 2 is removed as seen in Fig. 12, the separating roller 9 is freed from the force of the spring 61 and moved out of pressing contact with the transport roller 5. The paper 1 as nipped between the rollers 5, 9 is then readily removable.

While the pressure lever 56 exerts pressure on the shaft 9a of the separating roller 9, the guide ring 57 of the lever 56 has a laterally elongated hole for retaining the roller shaft 9a therein. The shaft 9a is laterally restrained by the vertically grooved portion 59 of the separate guide plate 58, so that the roller 9 is pressed on at all times from immediately below the transport roller 5.

The present invention is not limited to the foregoing embodiments. These embodiments can of course be modified or altered within the scope of the invention.

For example, the clutches are not limited to spring clutches but can be friction clutches, meshing clutches or the like.

Claims

1. A paper feeder (K) comprising
   - a paper feed table (2) for placing paper (1) thereon,
   - a transport roller (5) for transporting the paper (1).

- a first shaft (6) supporting the transport roller (5) thereon,
- a delivery roller (8) mounted on a first pivotably arm (7) for delivering the paper (1) from the feed table (2) to the transport roller (5) and
- a shutter (12) attached to a second pivotably arm (11) for preventing delivery of paper (1) to the transport roller (5) **characterized by**
- feed rollers (3, 4) for forwarding the paper (1) transported by the transport roller (5),
- whereby said first arm (7) is supported by the first shaft (6) and extends toward the feed table (2),
- whereby said second arm (11) is pivotably supported by a second shaft (10) and is disposed between the delivery roller (8) and the transport roller (5),
- a first cam (39) and a first cam shaft (38) therefor for pivotally moving the first arm (7) to thereby shift the delivery roller (8) to an operative position, and
- a second cam (72) and a second cam shaft (38) therefor for pivotally moving the second arm (11) to thereby shift the shutter (12) to an operative position when the first arm (7) is not pivotally moved, the first cam shaft and the second cam shaft being combined together in the form of a single rotary shaft (38).

2. A paper feeder as defined in claim 1 wherein the rotary shaft (38) comprises a torque transmission shaft, a driven shaft having the first and second cams (39, 72) mounted thereon, and a second clutch (41) provided between the shafts.

3. A paper feeder as defined in claim 2 wherein the first shaft (6) comprises a torque transmission shaft, a driven shaft having the transport roller (5) mounted thereon and a first clutch (15) provided between these shafts.

4. A paper feeder as defined in claim 3 wherein the first clutch (15) and the second clutch (41) respectively comprise first and second clutch portions, first and second power transmitting members (21; 48, 49) and drive means (22) for moving these members to operate the respective clutch portions for a clutch action.

5. A paper feeder as defined in claim 4 wherein a single solenoid (22) provides drive means in combination.

6. A paper feeder as defined in claim 1 wherein the feed table (2) is removably attached to the body (13) of an apparatus for use with the feeder, and the transport roller (5) is provided with a separating roller (9), a support member (58) for supporting the separating roller (9) upwardly and downwardly movably, pressure means (54) for pressing the support member (56) to bring the separating roller (9) into pressing contact with the transport roller (5), and release means (54A) for bringing the pressure means (54) out of operation with the removal of the feed table (2).

7. A paper feeder as defined in claim 6 wherein the support member comprises a vertically grooved support plate (58) for supporting a separating roller (9) carrying shaft on the apparatus body (13) upwardly and downwardly movably, and the release means (54A) comprises a pivotal piece (63) supported by the apparatus body (13) and pivotally movable when the feed table (2) is attached to or removed from the apparatus body (13), the pressure means (54) comprising a guide ring (57) for guiding the roller shaft (9a) substantially laterally, a lever (50) having the guide ring (57) secured thereto and movably supported by a pivot (55) on the apparatus body (13), and a coiled spring (61) wound around the lever (56) supporting pivot (55) and having one end engaged with the lever (56) and the other end engaged with the pivotal piece (63) for pivotally moving the lever (56) by the movement of the pivotal piece (63) when the feed table (2) is removed from the apparatus body (13) to release the separating roller (9) from pressing contact with the transportion roller (5).

Patentansprüche

1. Papierbogenzuführungsvorrichtung (K) mit
   - einem Bogenauflagetisch (2) zum Aufnehmen der Bögen (1),
   - einer Transportrolle (5) zum Transportieren der Bögen (1),
   - einer ersten Welle (6), an der die Transportrolle (5) gelagert ist,
   - einer an einem ersten drehbaren Arm (7) befestigte Zuführungsrolle (8) zum Zuführen des Bogens (1) von dem Bogenauflagetisch (2) zu der Transportrolle (5) und
   - eine einem zweiten drehbaren Arm (11) zugeordnete Sperreinheit (12) zum Verhindern des Zuführens von Papierbögen (1) zu der Transportrolle (5),

- **gekennzeichnet durch** Vorschubrollen (3, 4) zum Vorwärtsbewegen des durch die Transportrolle (5) transportierten Bogens (1),
- wobei der erste Arm (7) durch die erste Welle (6) gelagert wird und in Richtung des oben Bogenauflagetisches (2) übersteht,
- wobei der zweite Arm (11) drehbar an der zweiten Welle (10) gelagert ist und zwischen der Zuführungsrolle (8) und der Transportrolle (5) angeordnet ist,
- eine erste Nocke (39) und eine zugehörige Nockenwelle (38) zum drehbaren Bewegen des ersten Arms (7), um dadurch die Zuführungsrolle (8) in eine Betriebsposition anzuheben und
- eine zweite Nocke (72) und eine zugehörige zweite Nockenwelle (38) zum drehbaren Bewegen des zweiten Arms (11), um die Sperreinheit (12) in eine Betriebspositon anzuheben, wenn der erste Arm (7) nicht gedreht wird, wobei die erste Nockenwelle und die zweite Nockenwelle in Form einer einzelnen Drehwelle (38) kombiniert ausgebildet sind.

2. Vorrichtung nach Anspruch 1, wobei die Drehwelle (38) eine Torsionsübertragungswelle, eine Antriebswelle mit darauf befestigten ersten und zweiten Nocken (39, 72) und eine zwischen den Wellen angeordnete zweite Kupplung (41) aufweist.

3. Vorrichtung nach Anspruch 2, wobei die erste Welle (6) eine Torsionsübertragungswelle, eine Antriebswelle, an der die Transportrolle (5) befestigt ist, und eine erste Kupplung (15), die zwischen den Wellen angeordnet sind, aufweist.

4. Vorrichtung nach Anspruch 3, wobei die erste Kupplung (15) bzw. zweite Kupplung (41) erste und zweite Kupplungsbereiche, erste und zweite Kraftübertragungselemente (21; 48, 49) und Antriebsmittel (22) zum bewegen dieser Elemente aufweist, damit die jeweiligen Kupplungsbereiche einen Kupplungsvorgang durchführen.

5. Vorrichtung nach Anspruch 4, wobei ein einzelner Solenoid (22) die Antriebsmittel in Kombination ansteuert.

6. Vorrichtung nach Anspruch 1, wobei der Bogenauflagetisch (2) abnehmbar an dem Körper (13) eines Geräts für den Einsatz der Vorrichtung befestigbar ist und die Transportrolle (5) mit einer Trennrolle (9) versehen ist, ein Lagerelement (58) zum beweglichen Lagern der Trennrolle (9) in Auf- und Abwärtsrichtung vorhanden ist, Andruckmittel (54) zum Anpressen des Lagerelements (58) damit die Trennrolle (59) in Andruckkontakt mit der Transportrolle (5) kommt, und Lösemittel (54 A) vorhanden sind, die die Andruckmittel (54) beim Abnehmen des Bogenauflagetisches (2) außer Betrieb setzen.

7. Vorrichtung nach Anspruch 6, wobei das Lagerelement eine Lagerplatte (58) mit vertikaler Ausnehmung zum in Auf- und Abwärtsrichtung beweglichen Lagern einer die Trennrolle (9) tragenden Welle auf dem Gerätekörper (13) aufweist, und die Lösemittel (54 A) ein drehbares Teil (63) enthalten ist, das dem Gerätekörper (13) gelagert ist und drehbar bewegbar ausgebildet ist, wenn der Auflagetisch an dem Gerätekörper (13) befestigt oder von dem Gerätekörper (13) abgenommen wird, die Andruckmittel (54) einen FÜhrungsring (57) zum im wesentlichen seitlichen FÜhren der Rollenwelle (9 A) aufweisen, ein Träger (56), an dem der FÜhrungsring (57) gesichert ist und der über einen Dreharm (55) beweglich an dem Gerätekörper (13) gelagert ist und eine Spiralfeder (61) vorhanden ist, die um den von dem Dreharm (55) gelagerten Träger (56) gewunden ist und deren eines Ende in den Träger (56) eingreift und deren anderes Ende in das drehbare Teil (63) zum drehbaren Bewegen des Trägers (56) durch die Bewegung des drehbaren Teils (63) eingreift, um die Trennrolle von dem Andruckkontakt mit der Transportrolle (5) zu lösen, wenn der Auflagetisch (2) von dem Gerätekörper (13) abgenommen wird.

Revendications

1. Distributeur de feuilles de papier (K) comprenant :

une table d'alimentation en feuilles (2) sur laquelle on place des feuilles (1),

un rouleau de transport (5) pour transporter la feuille (1),

un premier arbre (6) supportant le rouleau de transport (5),

un rouleau de transfert (8) monté sur un premier bras pivotant (7), pour transférer la feuille (1) de la table d'alimentation (2) au rouleau de transport (5), et

un volet obturateur (12) fixé à un deuxième bras pivotant (11) pour empêcher le transfert de la feuille (1) au rouleau de transport (5), caractérisé en ce qu'il comprend :

des rouleaux de distribution (3,4) pour faire

avancer la feuille (1) transportée par le rouleau de transport (5),

le premier bras (7) étant supporté par le premier arbre (6) et s'étendant vers la table d'alimentation (2), et le deuxième bras (11) étant supporté de façon pivotante par un deuxième arbre (10) et étant disposé entre le rouleau de transfert (8) et le rouleau de transport (5),

une première came (39) et un premier arbre de came (38) pour cette came, afin de faire pivoter le premier bras (7) de manière à amener le rouleau de transfert (8) à une position active, et

une deuxième came (72) et un deuxième arbre de came (38) pour cette came, afin de faire pivoter le deuxième bras (11) de manière à amener le volet (12) à une position active lorsque le premier bras (7) n'a pas pivoté, le premier arbre de came et le deuxième arbre de came étant mutuellement combinés sous la forme d'un arbre rotatif unique (38).

2. Distributeur de feuilles suivant la revendication 1, dans lequel l'arbre rotatif (38) comprend un arbre de transmission de couple, un arbre entraîné sur lequel sont montées les première et deuxième cames (39, 72), et un deuxième embrayage (41) prévu entre les arbres.

3. Distributeur de feuilles suivant la revendication 2, dans lequel le premier arbre (6) comprend un arbre de transmission de couple, un arbre entraîné sur lequel est monté le rouleau de transport, et un premier embrayage (15) prévu entre ces arbres.

4. Distributeur de feuilles suivant la revendication 3, dans lequel le premier embrayage (15) et le deuxième embrayage (41) comprennent respectivement une première et une deuxième parties d'embrayage, un premier et un deuxième éléments de transmission de puissance (21;48,49) et des moyens d'entraînement (22) pour déplacer ces éléments de manière à actionner les parties d'embrayage respectives pour une action d'embrayage.

5. Distributeur de feuilles suivant la revendication 4, dans lequel un solénoïde unique (22) constitue les moyens d'entraînement en combinaison.

6. Distributeur de feuilles suivant la revendication 1, dans lequel la table d'alimentation (2) est fixée de façon démontable au bâti (13) d'un appareil utilisable avec le distributeur, et le rouleau de transport (5) est pourvu d'un rouleau de séparation (9), un support (58) pour supporter le rouleau de séparation (9) de façon mobile vers le haut et le bas, des moyens de pression (54) pour presser le support (56) de manière à amener le rouleau de séparation (9) en contact de pression avec le rouleau de transport (5), et des moyens de libération (54A) pour désactiver les moyens de pression (54) lors du démontage de la table d'alimentation (2).

7. Distributeur de feuilles suivant la revendication 6, dans lequel le support comprend une plaque support rainurée verticalement (58) pour supporter un arbre de rouleau de séparation (9) sur le bâti de l'appareil (13) de façon mobile vers le haut et le bas, et les moyens de libération (54A) comprennent une pièce pivotante (63) supportée par le bâti de l'appareil (13) et déplaçable de façon pivotante lorsque la table d'alimentation (2) est fixée au bâti de l'appareil (13) ou démontée de celui-ci, les moyens de pression (54) comprenant un anneau de guidage (57) pour guider l'arbre de rouleau (9a) sensiblement latéralement, un levier (50) auquel est fixé l'anneau de guidage (57) et qui est supporté de façon mobile par un pivot (55) sur le bâti de l'appareil (13), et un ressort hélicoïdal (61) enroulé autour du pivot (55) du levier (56) et ayant une extrémité en prise avec le levier (56) et l'autre extrémité en prise avec la pièce pivotante (63) de manière à faire pivoter le levier (56) du fait du mouvement de la pièce pivotante (63) lorsque la table d'alimentation (2) est démontée du bâti de l'appareil (13), pour libérer le rouleau de séparation (9) du contact de pression avec le rouleau de transport (5).

FIG. 1

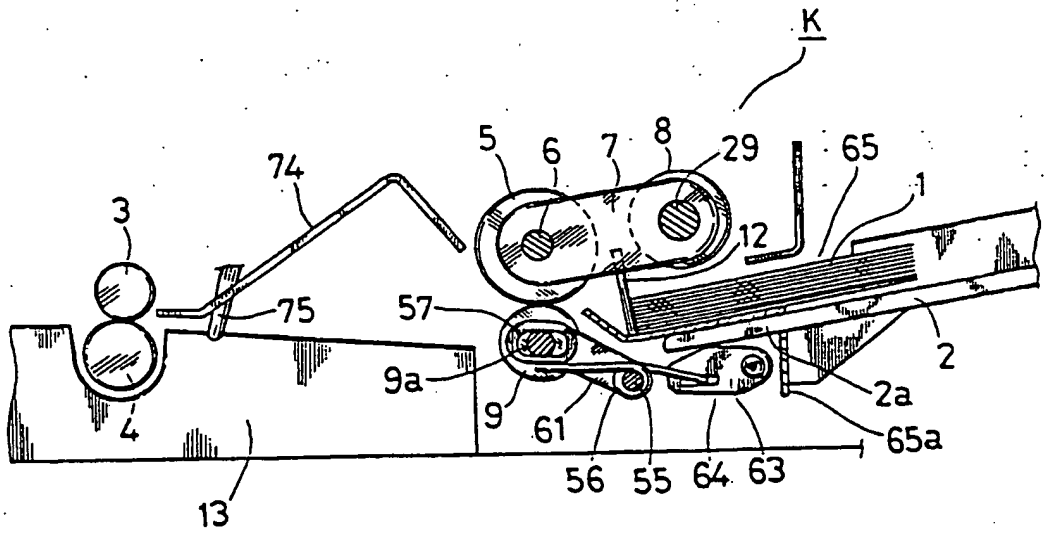

FIG. 2a

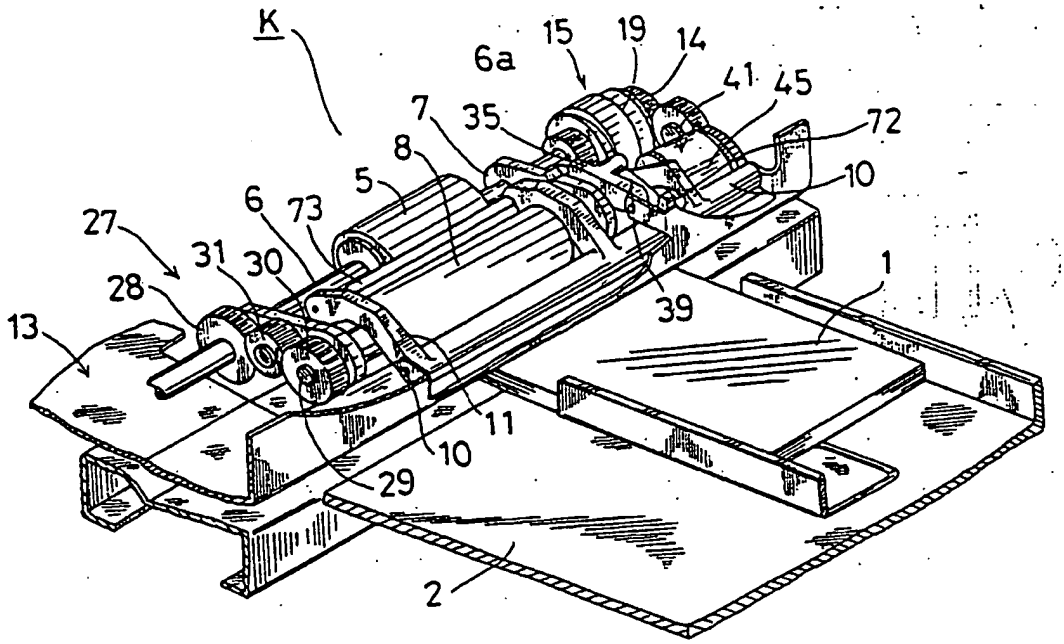
K
6a
15
19
14
41
45
72
7
35
8
5
10
6
73
27
31
30
28
13
1
39
11
10
29
2

FIG. 2b

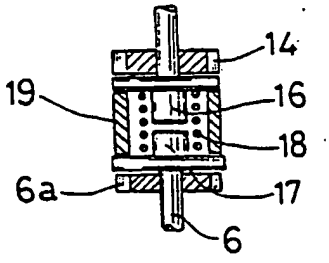
14
19
16
18
6a
17
6

FIG. 4a

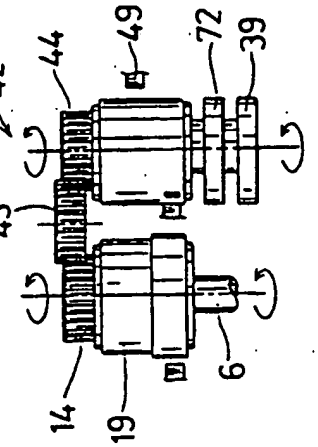

FIG. 4b

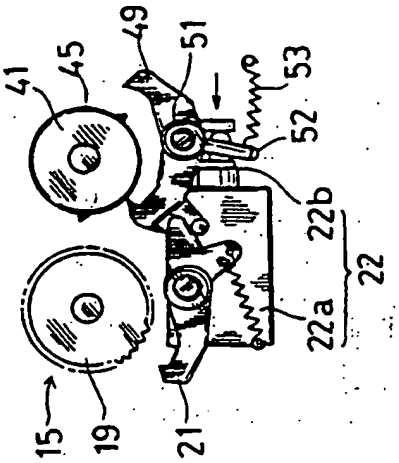

FIG. 3a

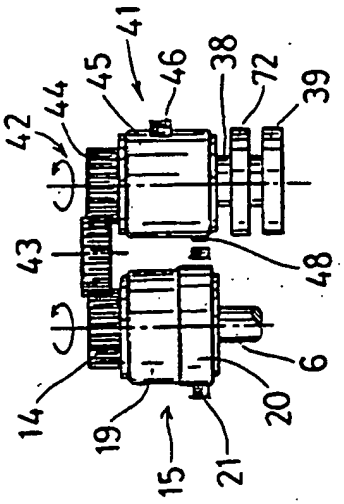

FIG. 3b

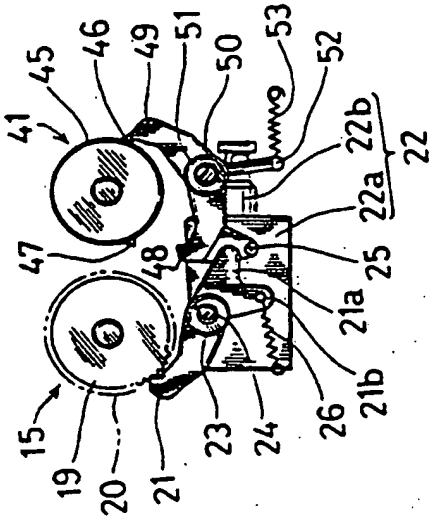

FIG. 6

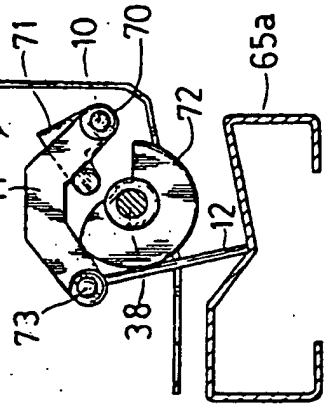

FIG. 7

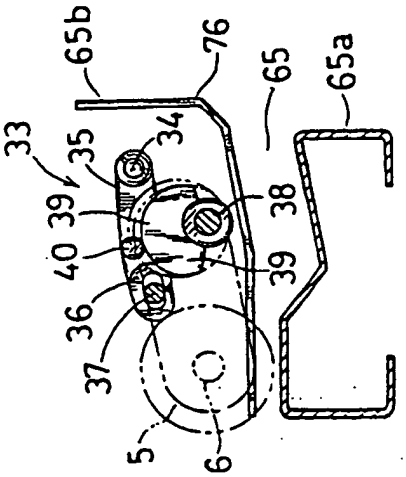

FIG. 5a

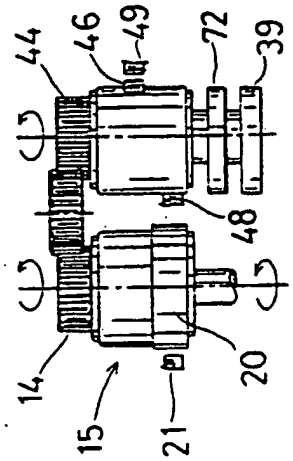

FIG. 5b

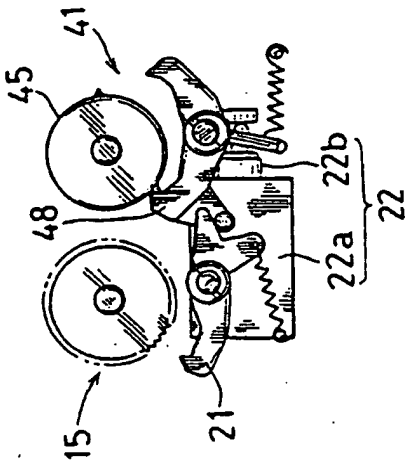

FIG. 10

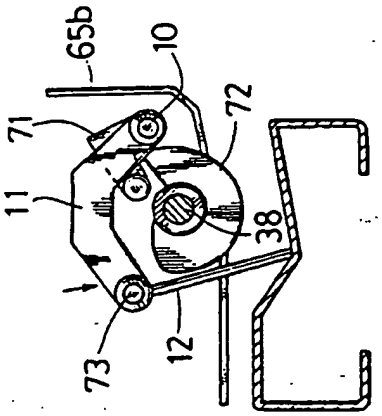

FIG. 11

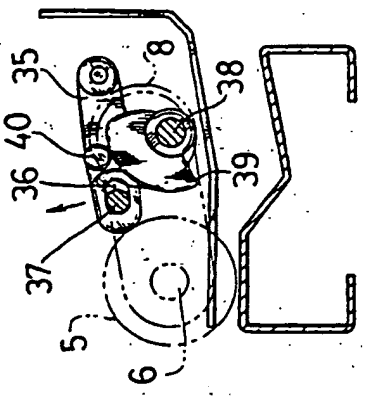

FIG. 8

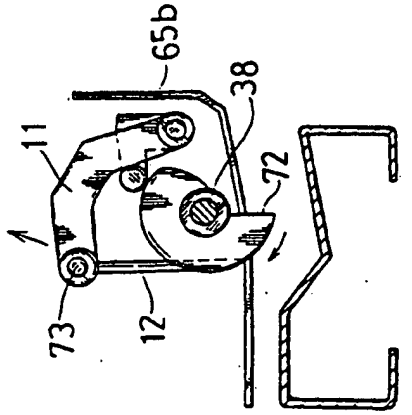

FIG. 9

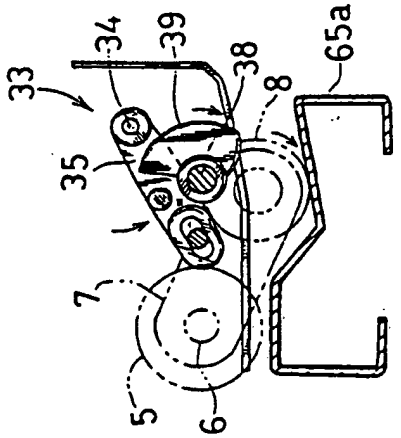

FIG. 12

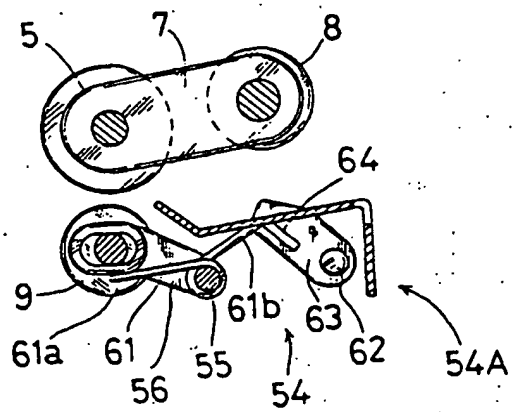

FIG. 13

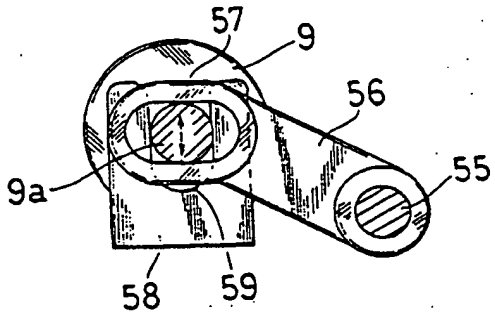

FIG. 15

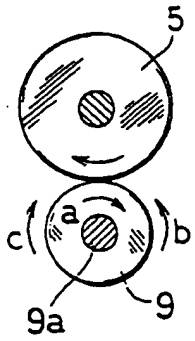

FIG. 14

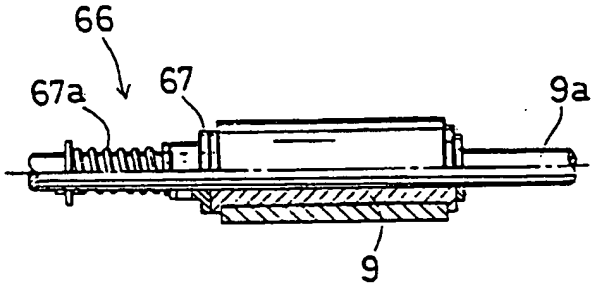

FIG. 16

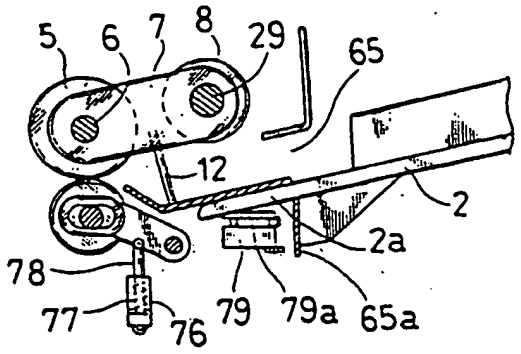

FIG. 17

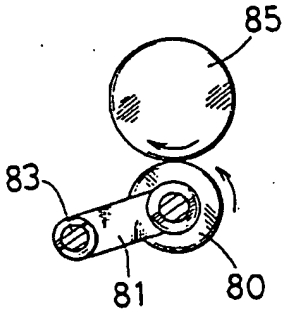

FIG. 18